Dataset Expocode	**09FS20110311**
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Investigator	**Name:** Sabin, Dr. Christopher **Organization:** NOAA-PMEL **Address:** 7600 Sand Point Way NE Seattle WA 98115 USA **Phone:** **Email:**
Dataset	**Funding Info:** Australian Climate Change Science Program **Initial Submission (yyyymmdd):** 20160202 **Revised Submission (yyyymmdd):**
Campaign/Cruise	**Expocode:** 09FS20110311 **Campaign/Cruise Name:** Heron Island_2 **Campaign/Cruise Info:** **Platform Type:** **CO2 Instrument Type:** Equilibrator-IR or CRDS or GC **Survey Type:** Moored Buoy **Vessel Name:** Heron Island **Vessel Owner:** CSIRO **Vessel Code:** 09FS
Coverage	**Start Date (yyyymmdd):** 20110311 **End Date (yyyymmdd):** 20110819 **Westernmost Longitude:** 151.925 E **Easternmost Longitude:** 151.927 E **Northernmost Latitude:** 23.458 S

Southernmost Latitude: 23.459 S

Variable
Name: DATE
Unit: YYYY-MM-DD hh:mm:ss
Description: date and time of measurement

Variable
Name: LATITUDE
Unit: degree +ve=N
Description:

Variable
Name: LONGITUDE
Unit: degree +=E
Description:

Variable
Name: xCO2_dry_SW
Unit: micromol/mol
Description: mole fraction of carbon dioxide (dry) in surface water and at equilibrator temperature and salinity

Variable
Name: SD_xCO2_dry_SW
Unit: micromol/mol
Description: standard deviation of 58 determinations over 30 seconds of XCO2_DRY_SW at each time stamp

Variable
Name: XCO2_DRY_SW_WOCE_FLAG
Unit:
Description: woce flag for XCO2_DRY_SW (good=2, questionable=3, bad=4)

Variable
Name: XCO2_DRY_AIR
Unit: micromol/mol
Description: mole fraction of carbon dioxide (dry) in air

Variable
Name: SD_XCO2_DRY_AIR
Unit: micromol/mol
Description: standard deviation of 58 determinations over 30 seconds of XCO2_DRY_AIR at each time stamp

Variable
Name: XCO2_DRY_AIR_WOCE_FLAG
Unit: micromol/mol
Description:

Variable
Name: fCO2_WET_SW
Unit: microatmospheres
Description:

Variable
Name: SD_fCO2_WET_SW
Unit: microatmospheres
Description: standard deviation of 58 calculations over 30 seconds of fCO2_WET_SW at each time stamp

Variable
Name: fCO2_WET_SW_WOCE_FLAG
Unit:
Description: woce flag for fCO2_WET_SW (2=good, 3-questionable, 4=bad)

Variable
Name: D_fCO2
Unit: microatmospheres
Description: Delta fCO2 = (fCO2_WET_SW - fCO2_WET_AIR)

Variable
Name: SD_D_fCO2
Unit: microatmospheres

Description: standard deviation of 58 determinations of D_fCO2 at each time stamp

Variable **Name:** D_fCO2_WOCE_FLAG
Unit:
Description: woce flag for D_fCO2 (2=good, 3-questionable, 4=bad)

Variable **Name:** ATMOSPHERIC_PRESSURE
Unit:
Description: atmospheric pressure

Variable **Name:** SD_ATMOSPHERIC_PRESSURE
Unit: kPa
Description: standard deviation of 58 measurements of ATMOSPHERIC_PRESSURE over 30 seconds at each time stamp

Variable **Name:** ATMOSPHERIC_PRESSURE_WOCE_FLAG
Unit:
Description: woce flag for ATMOSPHERIC_PRESSURE (2=good, 3-questionable, 4=bad)

Variable **Name:** EQUILIBRATOR_PRESSURE
Unit: kPa
Description: pressure of equilibrator

Variable **Name:** SD_EQUILIBRATOR_PRESSURE
Unit: kPa
Description: standard deviation of 58 measurements of EQUILIBRATOR_PRESSURE over 30 seconds at each time stamp

Variable **Name:** EQUILIBRATOR_PRESSURE_WOCE_FLAG
Unit:
Description: woce flag for EQUILIBRATOR_PRESSURE (2=good, 3-questionable, 4=bad)

Variable **Name:**
Unit: degree centigrade
Description: sea surface temperature

Variable **Name:** SEA_SURFACE_TEMPERATURE_WOCE_FLAG
Unit:
Description: woce flag for SEA_SURFACE_TEMPERATURE (2=good, 3=questionable, 4=bad)

Variable **Name:** EQUILIBRATOR_TEMPERATURE
Unit: degree centigrade
Description: equilibrator temperature

Variable **Name:** EQUILIBRATOR_TEMPERATURE_WOCE_FLAG
Unit:
Description: woce quality control flag for EQUILIBRATOR_TEMPERATURE (2=good, 3=questionable, 4=bad)

Variable **Name:** SALINITY
Unit:
Description: sea surface salinity

Variable **Name:** SALINITY_WOCE_FLAG
Unit:

	Description: woce flag for SALINITY (2=good, 3=questionable, 4=bad)
Variable	**Name:** DISSOLVED_OXYGEN **Unit:** micromol/litre **Description:** dissolved oxygen
Variable	**Name:** SD_DISSOLVED_OXYGEN **Unit:** micromol/litre **Description:** standard deviation of DISSOLVED_OXYGEN measurements
Variable	**Name:** DISSOLVED_OXYGEN_WOCE_FLAG **Unit:** **Description:** woce quality control flag for DISSOLVED_OXYGEN (2=good, 3=questionable, 4=bad)
Sea Surface Temperature	**Location:** 1m on mooring next to equilibrator **Manufacturer:** Sea-Bird Electronics **Model:** SBE 16plusV2 **Accuracy:** 0.005 (°C if units not given) **Precision:** 0.001 (°C if units not given) **Calibration:** 09-Apr-10, factory calibrated before purchase. **Comments:**
Sea Surface Salinity	**Location:** 1m **Manufacturer:** Sea-Bird Electronics **Model:** SBE 16plusV2 **Accuracy:** 0.01 **Precision:** 0.003 **Calibration:** 09-Apr-10, factory calibrated before purchase. **Comments:**
Atmospheric Pressure	**Location:** Sensor is connected to an air block on mooring at 1m above sea level that is vented at the time of measurement **Normalized to Sea Level:** yes **Manufacturer:** LICOR **Model:** LICOR 820 internal sensor **Accuracy:** 0.5 kPa (hPa if units not given) **Precision:** 0.01 kPa (hPa if units not given) **Calibration:** Date not recorded and based on laboratory comparison against Druck DPI 142 pressure indicator carried out pre and post deployment **Comments:**
Atmospheric CO2	**Measured/Frequency:** Yes, 2 hourly **Intake Location:** 1m above sea level **Drying Method:** **Atmospheric CO2 Accuracy:** 2 micromol/mol **Atmospheric CO2 Precision:** 0.2 micromol/mol
Aqueous CO2 Equilibrator Design	**System Manufacturer:** **Intake Depth:** 1 **Intake Location:** base of surface mooring buoy **Equilibration Type:** headspace equilibrator as described in Sutton et al., 2014 **Equilibrator Volume (L):** 0.1 **Headspace Gas Flow Rate (ml/min):** 200 **Equilibrator Water Flow Rate (L/min):** see Sutton et al., 2014 **Equilibrator Vented:** Yes **Equilibration Comments:**

Drying Method: partial using silica gel, typically 50-60% humidity and a relative humidity sensor is used to correct for water vapour

Aqueous CO2 Sensor Details

Measurement Method: IR
Method details: NDIR
Manufacturer: LI-COR
Model: 820
Measured CO2 Values: xCO2(dry)
Measurement Frequency: 2 hourly
Aqueous CO2 Accuracy: 2 micromol/mol
Aqueous CO2 Precision: 0.2 micromol/mol
Sensor Calibrations: Sensor deployment is checked each two hourly measurement cycle using a zero and span gas. The sensor was checked post deployment against a range of 4 CO2-in-air standards to ensure measurements are within 2 micromol/mol of reference standard values between zero and 450 micromol/mol
Calibration of Calibration Gases: Ship
Number Non-Zero Gas Standards: 1
Calibration Gases:
MANUFACTURER:NOAA Earth Systems Laboratory, USA
CYLINDER NUMBER: JB02724
GAS CYLINDER PRESSURE, PRE-DEPLOYMENT: 2000 psi
GAS CYLINDER PRESSURE, POST-DEPLOYMENT: Unknown psi
CO2-IN-AIR CONCENTRATION (WMO X2007): 509.15 PPM
CALIBRATION DATE: 2009-07-14
Zero gas reference is generated by circulating air through soda-lime at each measurement cycle.
Comparison to Other CO2 Analyses:
Comments:
Method Reference:
Sutton, A.J., C. L. Sabine, S. Maenner-Jones, N. Lawrence-Slavas, C. Meinig, R. A. Feely, J. T. Mathis, S. Musielewicz, R. Bott, P. D. McLain, H. J. Fought, and A. Kozyr (2014) A high-frequency atmospheric and seawater pCO2 data set from 14 open-ocean sites using a moored autonomous system. Earth System Science Data, 6, 353-366. doi:10.5194/essd-6-353-2014.

Equilibrator Temperature Sensor

Location: Tequ is the same as the Sea Surface Temperature, and is located next to the equilibrator
Manufacturer: Sea Bird Electronics
Model: SBE 16plusV2
Accuracy: 0.005 (°C if units not given)
Precision: 0.001 (°C if units not given)
Calibration: 09-Apr-2010, factory calibrated before purchase.
Comments:

Equilibrator Pressure Sensor

Location: Airblock at about 1m above sea level is used to even the LI-COR pressure sensor
Manufacturer: LI-COR
Model: 820
Accuracy: 5 (hPa if units not given)
Precision: 0.1 (hPa if units not given)
Calibration: Based on laboratory comparison against Druck DPI 142 pressure indicator that were carried out pre and post deployment

Comments: Pequ is considered the same as Patm due to the venting of the LI-COR 820 pressure sensor through an air block at the time of each measurement

Other Sensor

Description: Dissolved oxygen
Manufacturer: Aanderaa
Model: 4175C
Accuracy: 1 micromol/litre
Precision: 1 micromol/litre
Calibration: PRE-DEPLOYMENT: 30-Nov-2010 POST-DEPLOYMENT: 29-Nov-2011
Comments: The optodes are calibrated at CSIRO, Hobart, using a purpose built calibration system, referenced to dissolved oxygen measurements made using modified Winkler titrations (Culberson, 1991). The calibrations cover a range of temperatures and oxygen concentrations that occur in the field and new calibration coefficients are generated to fit a Stern-Volmer equation (Uchida et al., 2008).

Additional Information

Suggested QC flag from Data Provider: NA
Additional Comments: The CO2/acidification mooring at the Heron Island was funded through and Ocean Carbon and Acidification project of the Australian Climate Change Science Program awarded to BT. Users of these data are requested to cite the data source as below and to send copies of manuscripts to the PI prior to submission to ensure data are accurately represented.
Citation for this Dataset:
We rely on users of these data to recognise the effort required to obtain data by citing these data as:
B. Tilbrook, E. van Ooijen, C. Neill, A. Sutton and C. Sabine (2011) High frequency ocean and atmosphere fCO2 timeseries measurements from Wistari Channel, Heron Island, Australia [insert dates]. http://imos.aodn.org.au/imos123/.
Other References for this Dataset:
http://imos.aodn.org.au/imos123/